

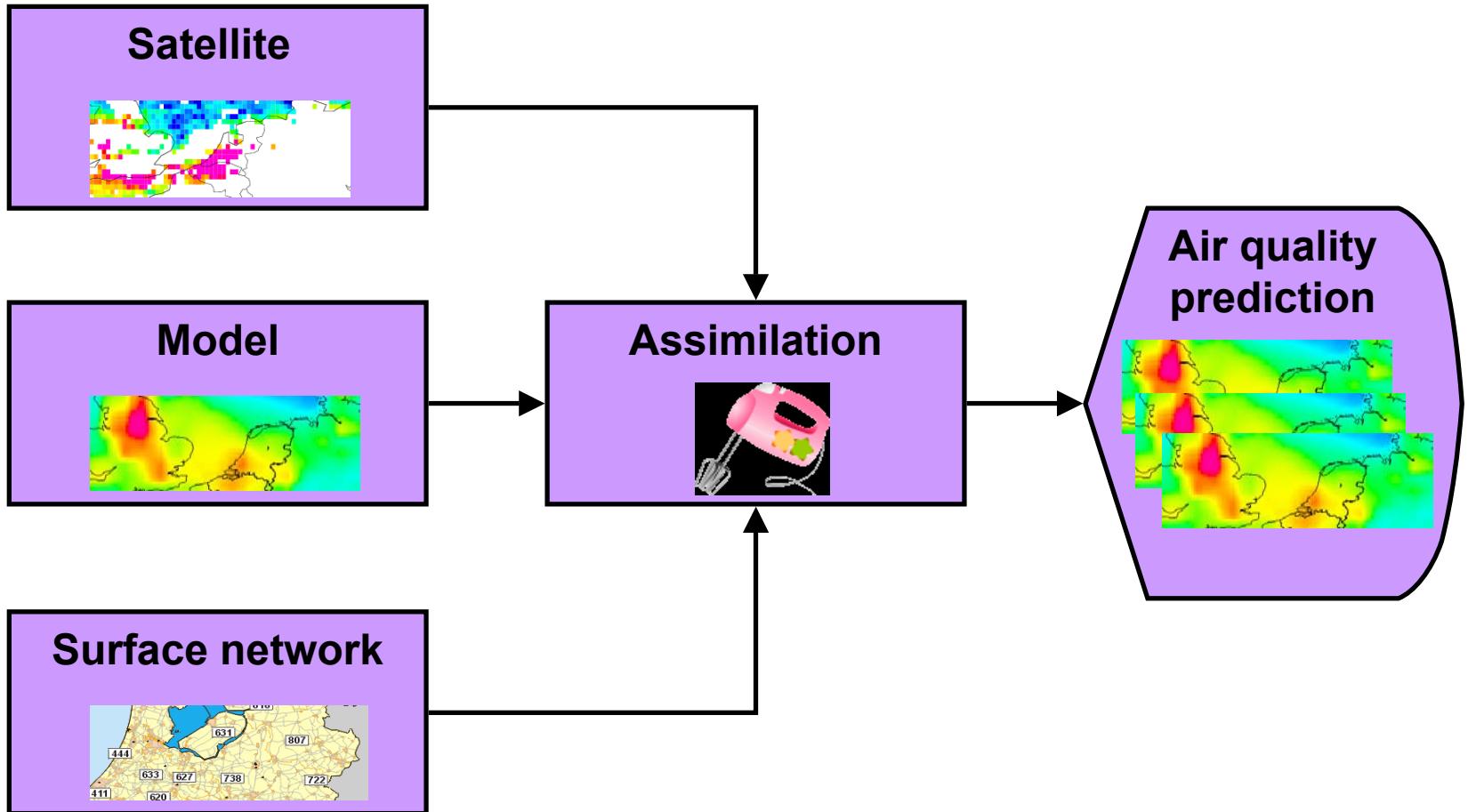
# Use of OMI data for assimilation and validation of air quality models in Europe

**Henk Eskes and Pieterneel Levelt**

Royal Netherlands Meteorological Institute (KNMI), Netherlands

- OMI and GEMS
- OMI and PROMOTE
- Air-quality monitoring and forecasting in the Netherlands and Europe

# The aim



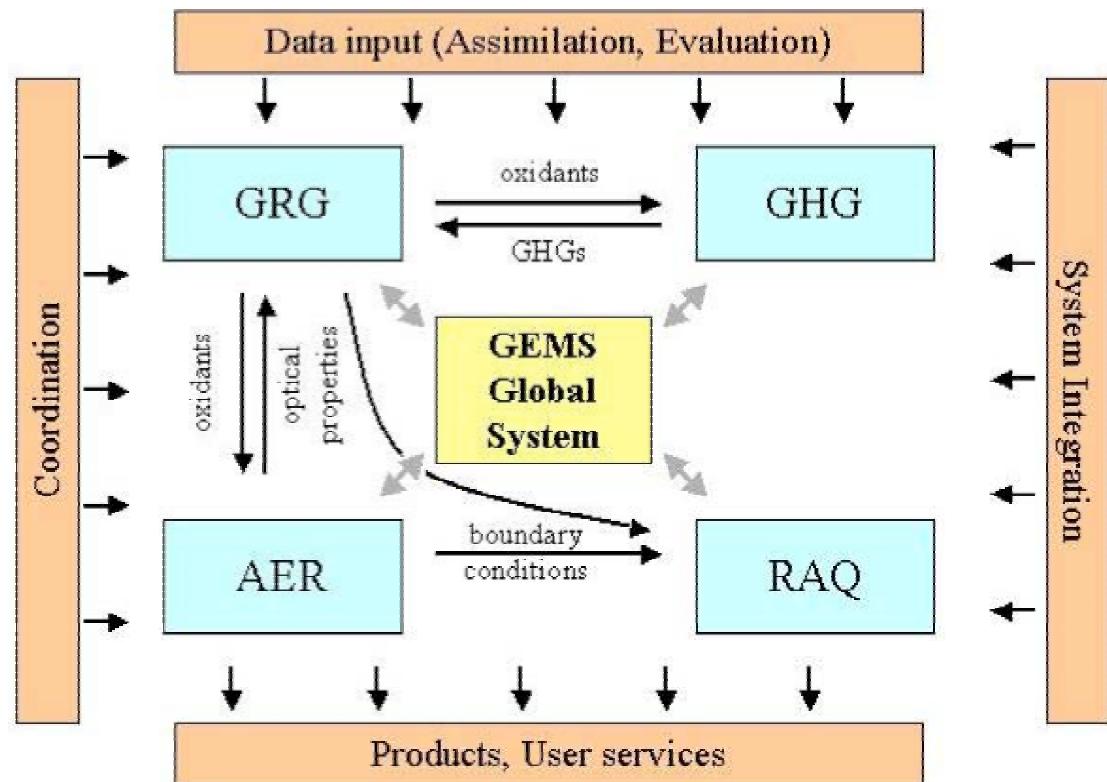
# The GEMS Project

Global & regional Earth-system Monitoring using Satellite and in-situ data  
 EU 6FP, GMES, 2005-2009, 27 partners

## Subprojects:

- Greenhouse gases
- Reactive gases
- Aerosols
- Regional air quality

First (trial) reanalysis  
 (period 2003/2004)  
 will start at end of 2006



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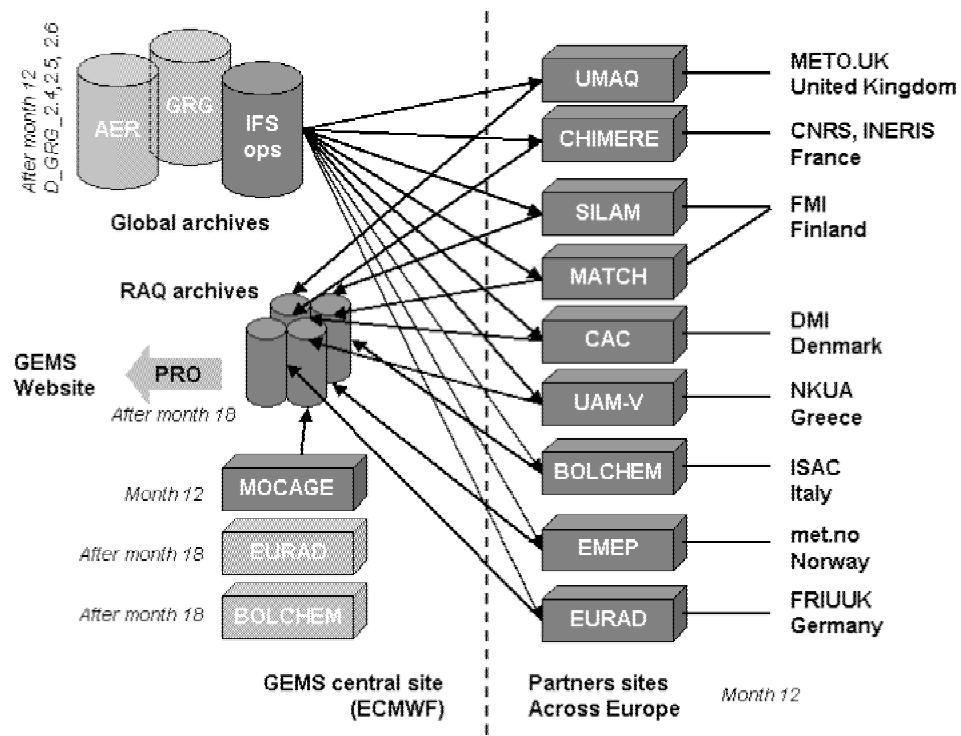
# GEMS: Regional air quality subproject

## Aspects:

- Many of the European regional AQ modelling groups involved
- Intercomparison of 11 European RAQ models on GEMS website
- Boundary conditions from GRG, AER
- Chemical assimilation at the regional scale  
(surface observations)
- NRT access to surface data
- Ensemble forecasts

## OMI and GEMS-RAQ:

- OMI nrt NO<sub>2</sub> will be included in intercomparison
  - OMI NO<sub>2</sub> products available for assimilation in RAQ models
- 



# GEMS: Reactive gas subproject

## Aspects:

- Two way coupling of ECMWF model with three CTMs: Mozart, Mocage, TM5, coupling via OASIS-4
- Assimilation for ozone, CO, NO<sub>2</sub>, SO<sub>2</sub>, CH<sub>2</sub>O, methane based on 4D-Var system of ECMWF
- Delivery of boundary conditions for RAQ
- Initial focus on troposphere

## OMI and GEMS-GRG:

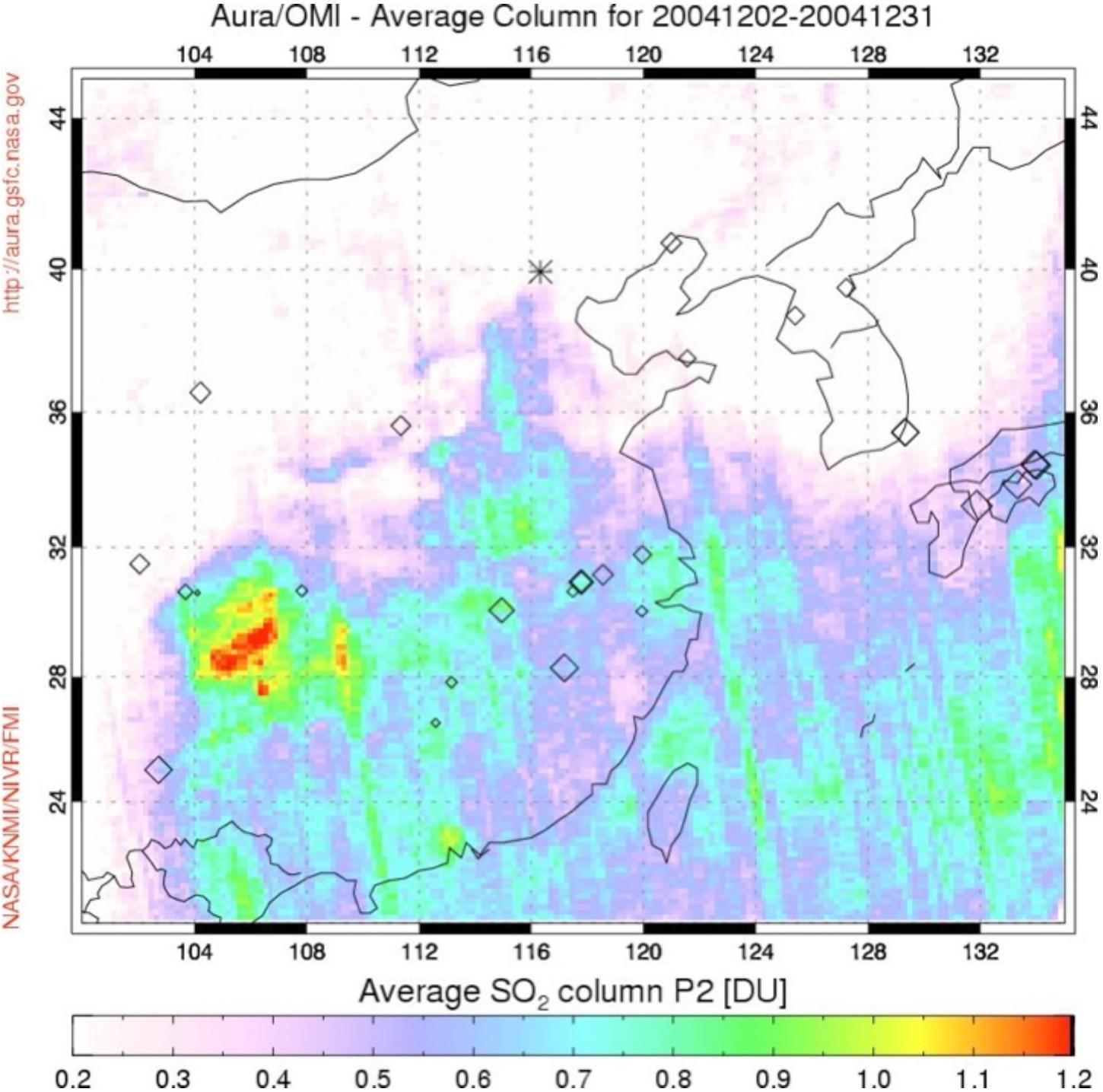
- OMI NO<sub>2</sub>, CH<sub>2</sub>O, SO<sub>2</sub> will be considered for / included in the first and second GEMS reanalysis
- Improve emissions (trends)

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# OMI SO<sub>2</sub>

Source:  
A. Krueger  
S. Carn  
(UMBC)

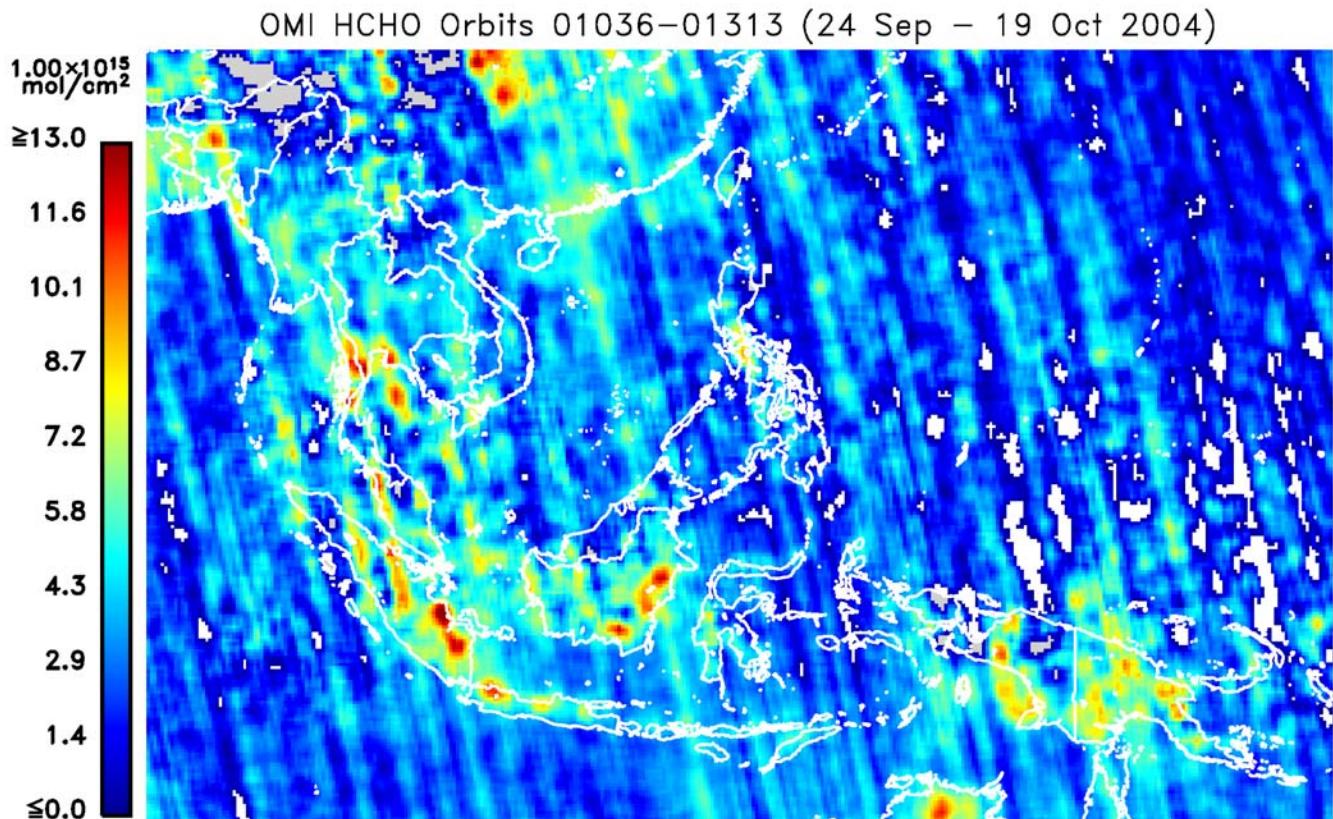
Presented at  
OMI Science  
Team meeting,  
KNMI,  
June 2005



# OMI CH<sub>2</sub>O

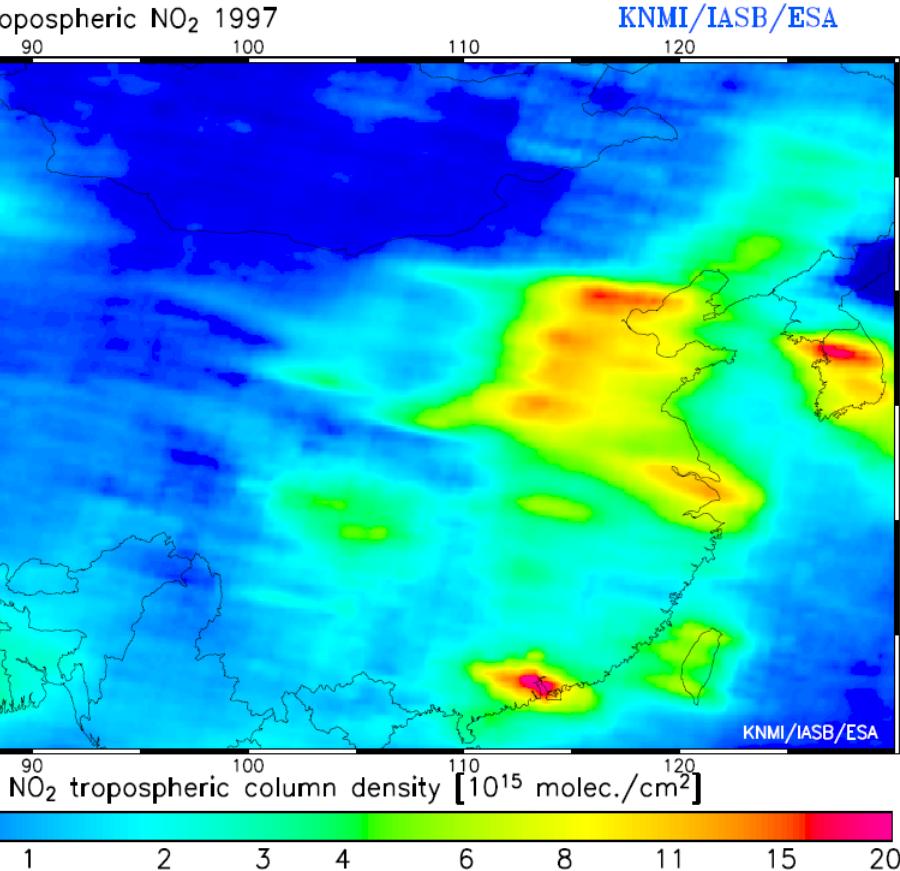
Source:  
K. Chance  
T. Koruso

Presented at  
OMI Science  
Team meeting,  
KNMI,  
June 2005

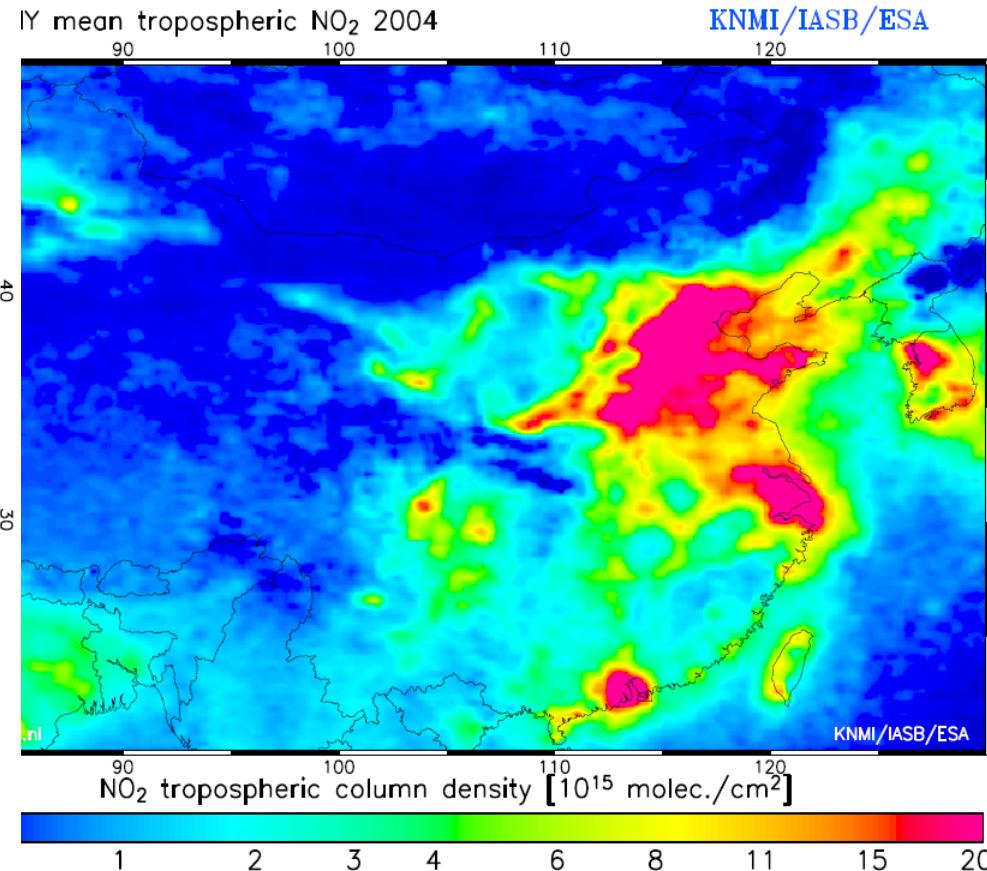


# Trend over China

**GOME, 1997**

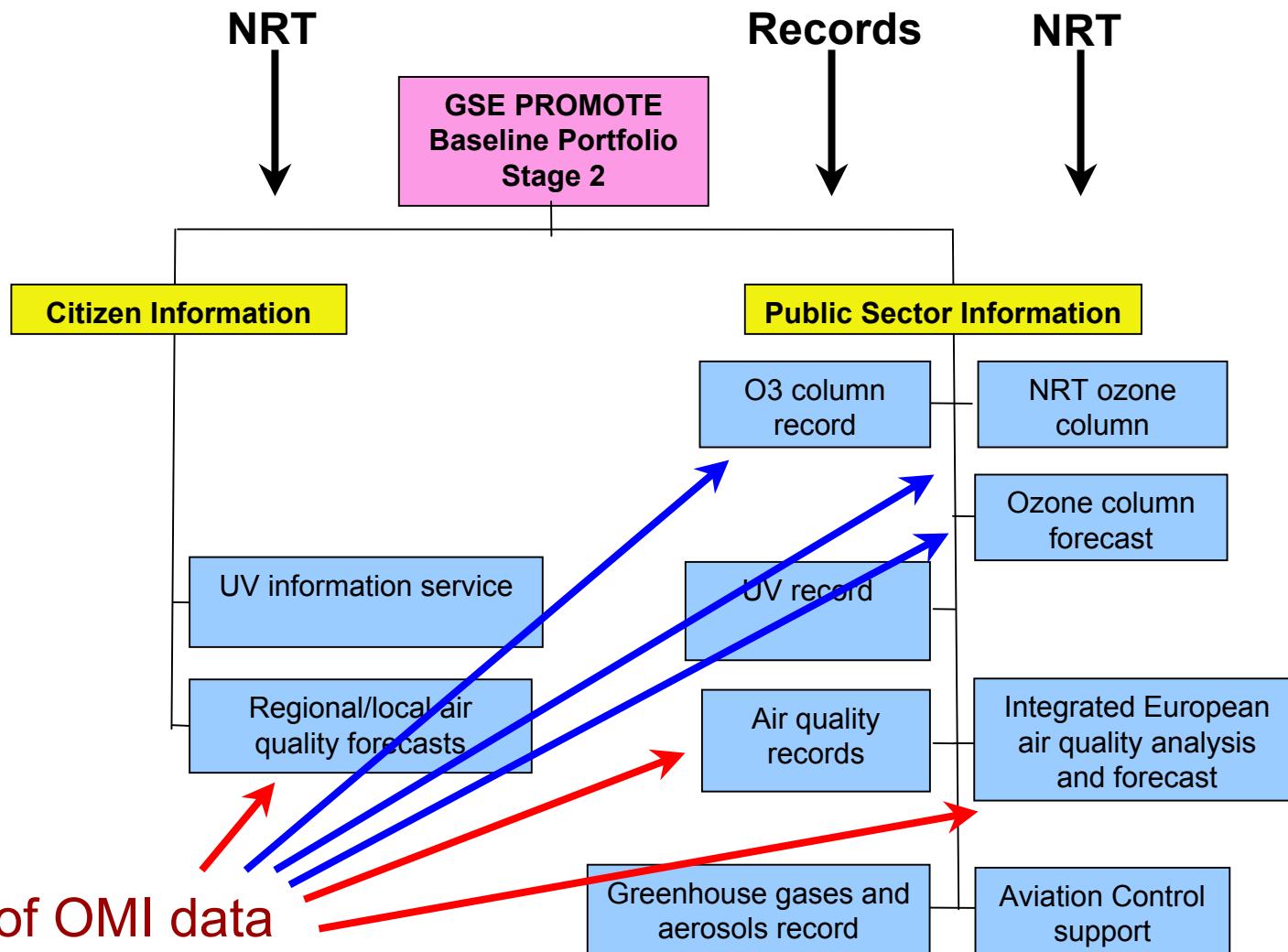


**SCIAMACHY, 2004**



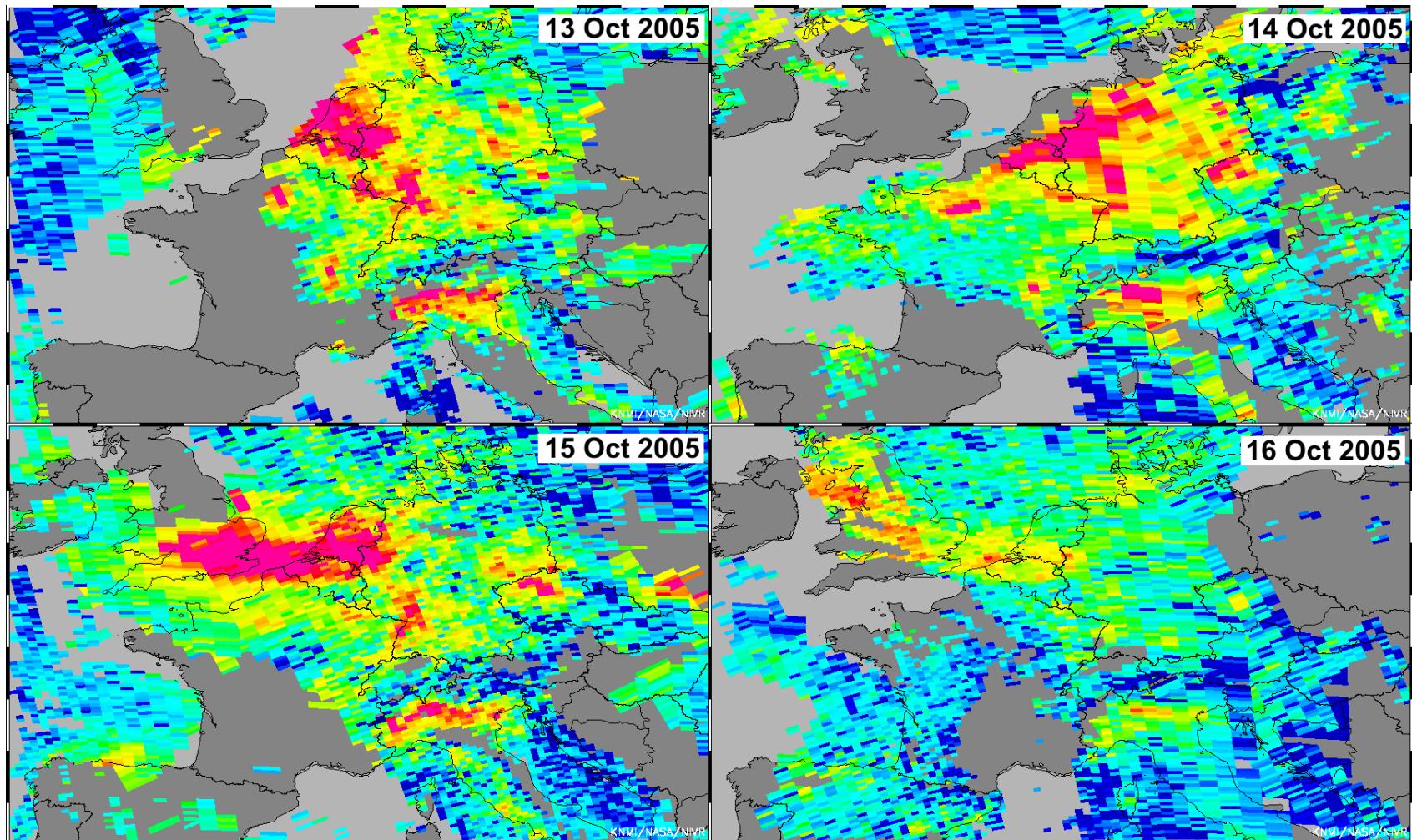
# OMI and PROMOTE

<http://www.gse-promote.org>

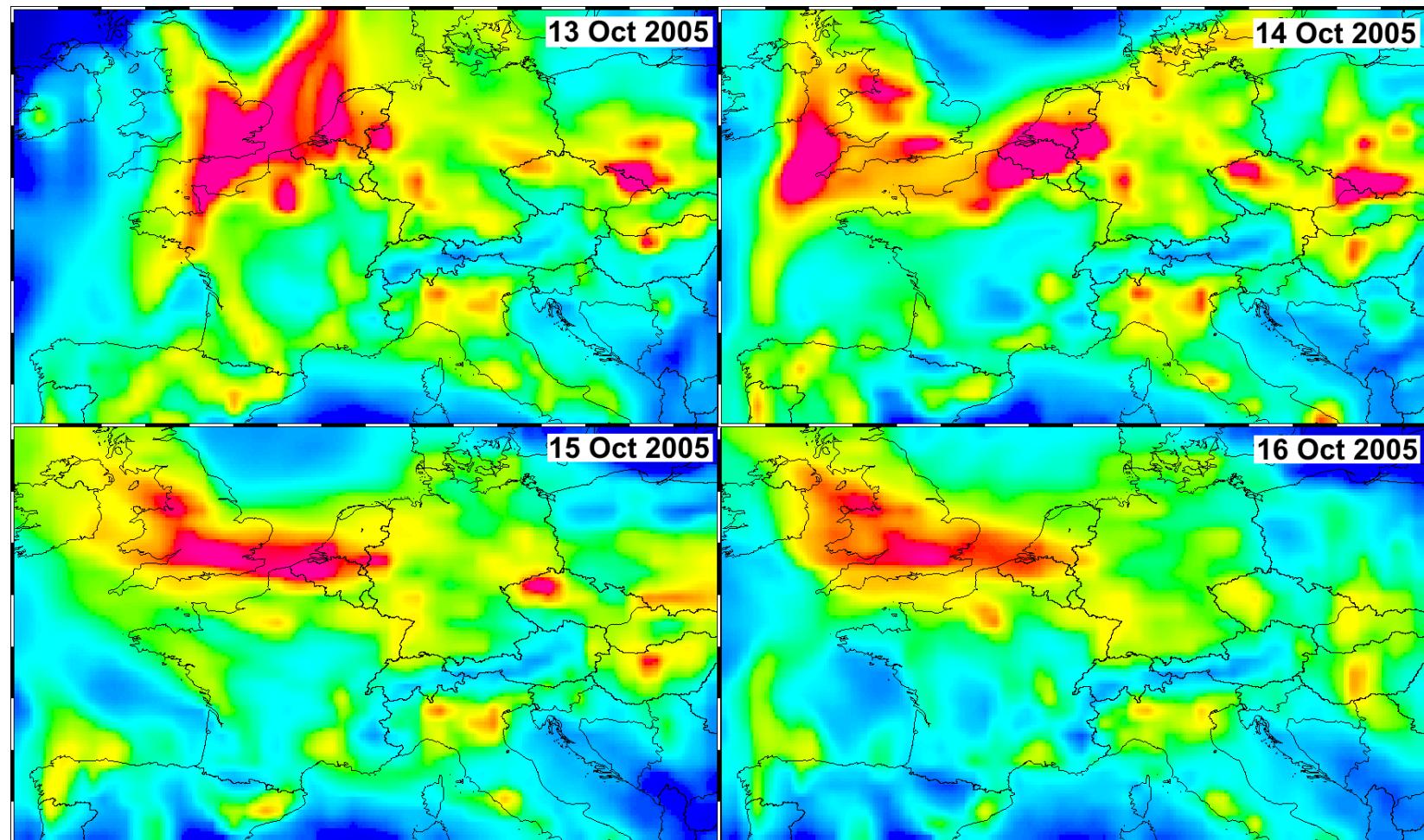


# Routine intercomparisons between OMI nrt NO<sub>2</sub> and regional air-quality forecast models for Europe and the Netherlands

# OMI near-real time NO<sub>2</sub>, 13-16 October 2005



# Chimere @ OMI overpass time, 13-16 Oct 2005



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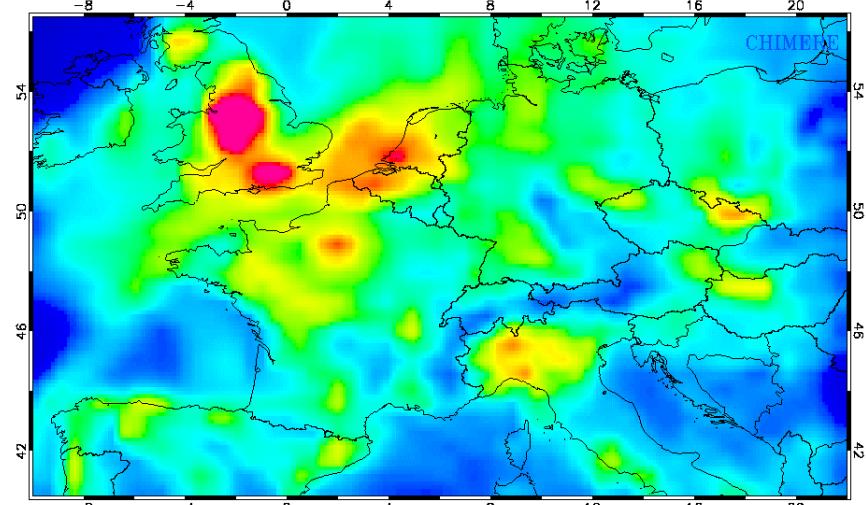
AURA Science, sep 2006

# Chimère vs OMI

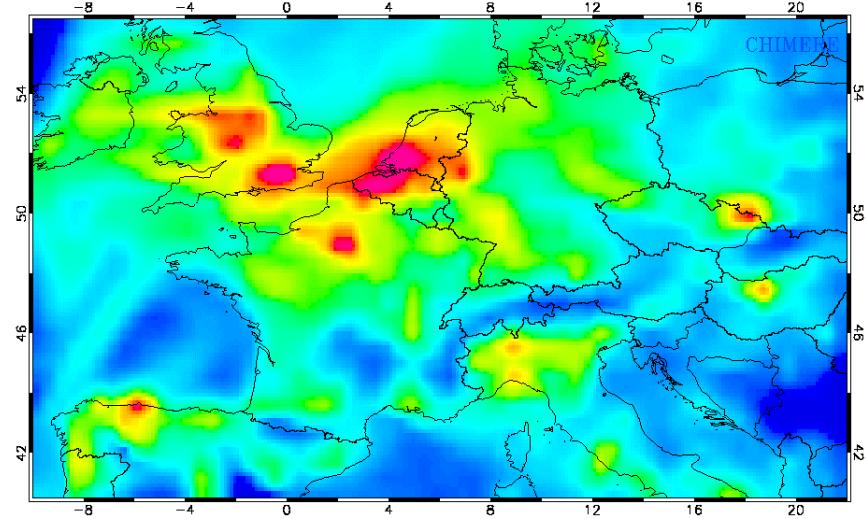


KNMI/FMI/NASA/NIVR

CHIMERE tropospheric NO<sub>2</sub> 03 Jul 2006 10.00 UTC KNMI

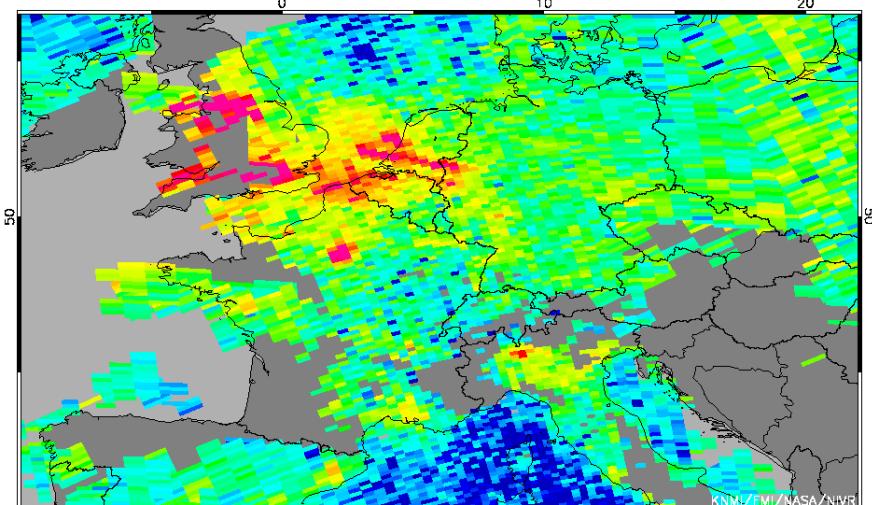


CHIMERE tropospheric NO<sub>2</sub> 04 Jul 2006 10.00 UTC KNMI

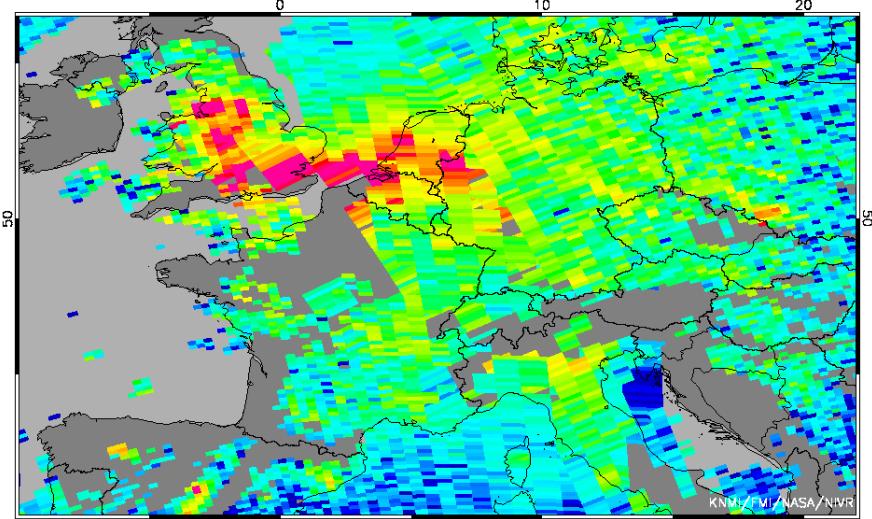


NO<sub>2</sub> tropospheric column [ $10^{15}$  molec./cm<sup>2</sup>]  
0 1 2 3 4 5 6 8 11 15 20

OMI mean tropospheric NO<sub>2</sub> 03 Jul 2006



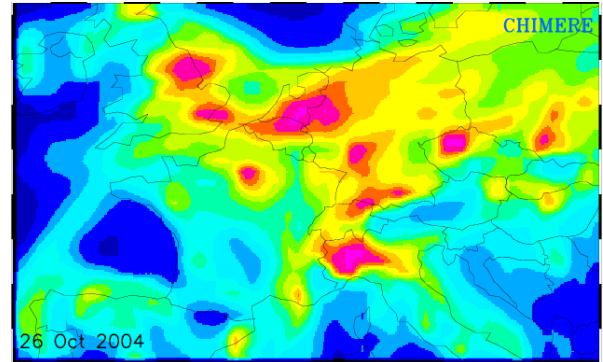
OMI mean tropospheric NO<sub>2</sub> 04 Jul 2006



NO<sub>2</sub> tropospheric column [ $10^{15}$  molec./cm<sup>2</sup>]  
0 1 2 3 4 6 8 11 15 20

# Backup

## Chimère model



Developed in France

R. Vautard, H. Schmidt, L. Menut, M. Beekman, N. Blond, ... )

Operational air-quality forecasts: <http://www.prevair.org/>

Model ingredients:

- MELCHIOR chemistry (82 species, 333 reactions)
- EMEP emissions
- ECMWF meteorological analyses
- 15 vertical layers, surface - 200 hPa
- Boundary conditions from MOZART monthly-mean climatology

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AURA Science, sep 2006

# Surface ozone assimilation

